

1. (Previously Presented and Once Amended) A method for communicating a data stream, the method comprising the steps of, generating a sequence of data symbols from the data stream, precoding the sequence of data symbols into a sequence of precoded data symbols, modulating the sequence of precoded data symbols into a continuous phase modulated signal, transmitting the continuous phase modulated signal, receiving the continuous phase modulated signal, and filtering the continuous phase modulated signal into a sequence of filtered signals having absolute phase for indicating the sequence of data symbols.

2. (Previously Presented and Once Amended ) The method of claim 1 further comprising the steps of, sampling the sequence of filtered signals into a sequence of sampled symbols, and demodulating the sequence of sampled symbols into an estimated data stream.

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1 3. (Previously Presented and Once Amended) The method of claim 1  
2 wherein,

3 the generating step comprises the steps of receiving the data  
4 stream of data bits, formatting the data stream into the sequence  
5 of formatted data pulses as a sequence of data symbols within an M-  
6 ary symbol set,

7 the modulating step comprises the steps of Gaussian filtering  
8 and frequency modulating for generating the continuous phase  
9 modulated signal, the Gaussian filter step filters the precoded  
10 sequence of data symbols into pulse responses continuously  
11 accumulated over a finite memory time as a filter response, the  
12 Gaussian filtering step is defined by a bandwidth time product  
13 inversely defining the finite memory time, the frequency modulating  
14 step frequency modulates a carrier reference by the filter response  
15 by a modulation index for converting the filter response into the  
16 continuous phase modulated signal,

17 the continuous phase modulated signal is up converted from  
18 baseband during the transmitting step and is down converted to  
19 baseband during the receiving step using a local carrier, and

20 the filtering step is a matched filtering step for matched  
21 filtering of the received continuous phase modulated signal into  
22 the filtered signal, the matched filtering is matched by pulse  
23 amplitude modulation representation to the Gaussian filtering step,  
24 the filtered signal has an absolute phase at a periodic sampling  
25 time for indicating the sequence of data symbols.

1 4. (Previously Presented and Twice Amended) The method of claim 3  
2 wherein,

3 the modulation index is equal to a fraction selected from a  
4 group consisting of  $1/M$  and  $(1-1/M)$  fractions for the M-ary symbol  
5 set where  $M=2^k$  and k is an integer.  
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7 5. (Previously Presented and Twice Amended) A method for  
8 communicating a data stream, the method comprising the steps of,  
9 generating a sequence of data symbols from the data stream by  
10 formatting the data stream into the sequence of formatted data  
11 pulses as a sequence of data symbols within a 2-ary symbol set,  
12 precoding the sequence of data symbols into a sequence of  
13 precoded data symbols,

14 Gaussian filtering the precoded sequence of data symbols into  
15 pulse responses continuously accumulated over a finite memory time  
16 as a filter response, the Gaussian filtering is defined by a  
17 bandwidth time product inversely defining the finite memory time,

18 frequency modulating a carrier reference by the filter  
19 response by a modulation index for converting the filter response  
20 into a continuous phase modulated signal, and

21 matched filtering the received continuous phase modulation  
22 signal into a filtered signal, the matched filtering is matched by  
23 pulse amplitude modulation representation to the Gaussian  
24 filtering, the filtered signal has an absolute phase at a periodic  
25 sampling time for indicating the sequence of data symbols.

1 6. (Previously Presented and Amended) The method of claim 5,  
2 wherein,

3 the sequence of data symbols has a data symbol  $d_n$  at a current  
4 symbol time  $n$  where  $n$  is an integer and has a data symbol  $d_{n-1}$  at an  
5 immediate previous symbol time  $n-1$  for precoding the data sequence  
6 into the sequence precoded data symbols having a precoded data  
7 symbol  $\alpha_n$  at the current symbol time, the precoding step is defined  
8 by  $\alpha_n = [d_n - d_{n-1} + 1]_{\text{mod}4}$ .

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10 7. (Previously Presented and Once Amended) The method of claim 5,  
11 wherein,

12 the sequence of data symbols has a data symbol  $d_n$  at a current  
13 symbol time  $n$  where  $n$  is an integer and has a data symbol  $d_{n-1}$  at an  
14 immediate previous symbol time  $n-1$  for precoding the data sequence  
15 into the sequence of precoded data symbols having a precoded data  
16 symbol  $\alpha_n$  at the current symbol time for even symbol times and for  
17 odd symbol times, the precoding step is defined by  $\alpha_n = [d_n - d_{n-1}$   
18  $+ 1]_{\text{mod}4}$  for even symbol times and  $\alpha_n = -[d_n - d_{n-1} + 1]_{\text{mod}4}$  for  
19 odd symbol times.

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1 8. (Previously Presented and Original) The method of claim 5  
2 wherein the modulation index is  $1/2$ .

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6 9. (Previously Presented and Original) The method of claim 5  
7 wherein the bandwidth time product is  $1/3$ .

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9 10. (Previously Presented and Original) The method of claim 5  
10 wherein the filtering step is a matched filtering step for applying  
11 a principal Laurent function to the baseband signal so that the  
12 filtered signal comprises a principal Laurent component.

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1 11. (Previously Presented and Twice Amended) A method for  
2 communicating a data stream, the method comprising the steps of,  
3 generating a sequence of data symbols from the data stream by  
4 formatting the data stream into the sequence of formatted data  
5 pulses as a sequence of data symbols within a 4-ary symbol set,  
6 precoding the sequence of data symbols into a sequence of  
7 precoded data symbols,  
8 Gaussian filtering the precoded sequence of data symbols into  
9 pulse responses continuously accumulated over a finite memory time  
10 as a filter response, the Gaussian filtering is defined by a  
11 bandwidth time product inversely defining the finite memory time,  
12 frequency modulating a carrier reference by the filter  
13 response by a modulation index for converting the filter response  
14 into a continuous phase modulated signal,  
15 matched filtering the continuous phase modulated signal into a  
16 filtered signal, the matched filtering is matched by pulse  
17 amplitude modulation representation to the Gaussian filtering, the  
18 filtered signal has an absolute phase at a periodic sampling time  
19 for indicating the sequence of data symbols, and  
20 demodulating the sequence of data symbols into an estimate of  
21 the data stream.

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1 12. (Previously Presented and Original) The method of claim 11,  
2 wherein,  
3 the sequence of data symbols has a data symbol  $d_n$  at a current  
4 symbol time  $n$  and has a data symbol  $d_{n-1}$  at an immediate previous  
5 symbol time  $n-1$  for precoding the data sequence into the sequence  
6 precoded data symbols having a precoded data symbol  $\alpha_n$  at the  
7 current symbol time, the precoding step is defined by  $\alpha_n = [d_n -$   
8  $d_{n-1} + 1]_{\text{mod}8}$ .

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11 13. (Previously Presented and Original) The method of claim 12  
12 wherein the precoded data symbol  $\alpha_n$  is defined by the 4-ary symbol  
13 set of +1, -1, +3 and -3.

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16 14. (Previously Presented and Original) The method of claim 12  
17 wherein the modulation index is  $1/4$ .

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1 15. (Previously Presented and Original) The method of claim 11,  
2 wherein,  
3 the sequence of data symbols has a data symbol  $d_n$  at a current  
4 symbol time  $n$  and has a data symbol  $d_{n-1}$  at an immediate previous  
5 symbol time  $n-1$  for precoding the data sequence into the sequence  
6 precoded data symbols having a precoded data symbol  $\alpha_n$  at the  
7 current symbol time, the precoding step is defined by  $\alpha_n = [d_n -$   
8  $d_{n-1} + 3]_{\text{mod}8}$ .

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10 16. (Previously Presented and Original) The method of claim 15  
11 wherein the precoded data symbol  $\alpha_n$  is defined by the 4-ary symbol  
12 set of +1, -1, +3 and -3.

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14 17. (Previously Presented and Original) The method of claim 15  
15 wherein the modulation index is  $1/4$ .

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17 18. (Previously Presented and Amended) The method of claim 11  
18 wherein the filtering step is a matched filtering step for applying  
19 a principal Laurent function, a third Laurent function and a  
20 twelfth Laurent function to the baseband signal so that the  
21 filtered signal comprises a principal Laurent component, a third  
22 Laurent component and a twelfth Laurent component.

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